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OPEN CHOLEDOCHOLITHOTOMY—A TIMELESS APPROACH TO BILIARY STONES: A PROSPECTIVE OBSERVATIONAL STUDY OF CHOLEDOCHOLITHIASIS & ITS SURGICAL MANAGEMENT AT A TERTIARY CARE HOSPITAL IN PATNA

General Surgery

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ABSTRACT

Introduction: Choledocholitiasis is the presence of calculi in the common bile duct. More common in patients with cholelithiasis CBD stones are often asymptomatic. However stones that are too large to pass through the ampulla of vater remain in the distal CBD and may cause obstructive jaundice, cholangitis or even pancreatitis. The diagnostic and therapeutic modalities for choledocholithiasis have evolved over time. ERCP and laparoscopic CBD exploration are the current treatment of choice yet an open CBD exploration is done in many cases. **Method:** This is a hospital-based prospective observational study carried out on 45 patients who fulfilled the inclusion criteria in the time period of April 2022 to December 2023 reported at Department of General Surgery, Nalanda Medical College and Hospital, Patna. **Results:** Mean age was 48.7±16.8 years. 71% of patients were females. Most patients were in the age group of 51-60 years. Biliary colic was the most common presentation. Most of the patients were managed with an open cholecystectomy followed by an open CBD exploration. Only 2 out of 45 required choledochoduodenostomy. Wound infection was the most common complication.

KEYWORDS

CBD stones, choledocholithiasis, choledocholithotomy, ERCP, MRCP, choledochoduodenostomy.

INTRODUCTION

Biliary stones are known to affect population since the dawn of civilization. Commonly referred to as choledocholithiasis CBD stones occur in 7-15% of cholecystectomy patients [1]. The consequence of a stone in CBD is either obstruction to bile flow or infection (cholangitis). CBD stones are categorized as:

I) Primary CBD stones—form within CBD due to bile stasis.
ii) Secondary CBD stones—form in gall bladder and later migrate to CBD.

Secondary CBD stones are much more common. Retained stones are secondary stones that develop in the duct within 2 years of cholecystectomy.

When symptomatic, choledocholithiasis presents with biliary type pain, jaundice and an abnormal LFT. CBD stones can be diagnosed with an ultrasound. More advanced methods of diagnosis include MRCP, ERCP or an intra-operative cholangiogram during cholecystectomy. For a long time an open surgical CBD exploration was the only procedure available for the treatment of CBD stones. However with advances in endoscopy and laparoscopy ERCP and lap CBD exploration have become feasible. The choice amongst these options depends on the facilities and skills available at the treating hospital. An open choledocholithotomy is still a preferred approach in many hospitals as it has not been yet demonstrated that laparoscopic CBD exploration is superior to open CBD exploration for treating CBD stones [2]. At our hospital also the treatment of choice for choledocholithiasis is open CBD exploration and T-tube drainage. T-tube allows the decompression of the biliary system while the CBD matures and heals.

MATERIALS AND METHOD

This prospective observational study was carried out in the department of General Surgery, Nalanda Medical College and Hospital, Patna from the period of April 2022 to December 2023. All patients of choledocholithiasis admitted in various units of Department of General Surgery were studied.

Inclusion Criteria

All patients undergoing open CBD exploration at the Dept. of General Surgery, NMCH.

Exclusion Criteria

- Suspected cases of biliary carcinomas.
- Patients not giving consent for the surgery or the study.

Patients who underwent CBD closure over a T-tube underwent T tube cholangiogram on POD 10 and removal of the T-tube was undertaken on POD 14.

RESULTS

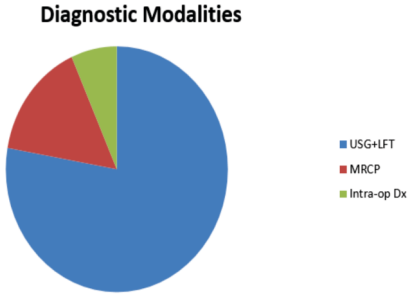
A total of 45 patients were operated on for choledocholithiasis. Detailed patient's history and thorough clinical examination were conducted. The age of the patients varied between 18 to 76 years with mean age being 48.7±16.8 years. Out of 45 patients 32 were female while 13 were males. Age wise distribution of cases is as following:

Age Group	No. of cases
<20 years	2
21-30 years	7
31-40 years	7
41-50 years	8
51-60 years	10
61-70 years	7
71-80 years	4

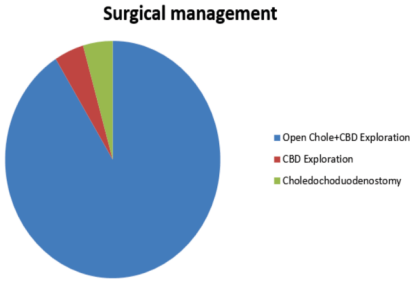
As apparent, most patients were in the age group of 51-60 years. The most common clinical presentation was noted to be biliary colic in the right upper quadrant. Other symptoms included jaundice and dyspepsia. A few patients also presented with acute pain abdomen and multiple episodes of vomiting with a positive Murphy's sign which was initially diagnosed as a case of acute cholecystitis.

Symptoms	No. of cases	Percentage
Jaundice	16	35.8%
Biliary Colic	20	44.6%
Acute cholecystitis	5	11.1%
Dyspepsia	4	8.5%

Out of the 45 cases, 42 were diagnosed pre-operatively based on LFT panel and USG or MRCP. While LFT and USG were utilized for all patients MRCP was required only in 7 cases. 3 patients were found to have CBD stones intra-operatively.

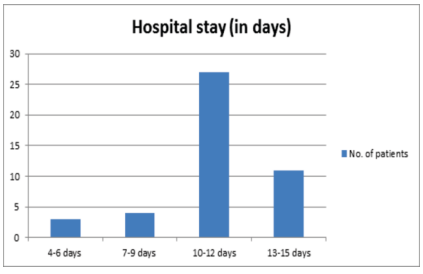


Once diagnosed 41 of these patients underwent open cholecystectomy with choledocholithotomy. 2 of the patients had had a cholecystectomy in the past and only CBD exploration was done for them. 2 patients underwent choledochoduodenostomy for drainage of bile after the CBD stones were extracted.



Once operated a total of 15 patients developed post-operative complications resulting from an open choledocholithotomy. All of them were known complications with no mortality. 3 of the patients had to undergo ERCP for the removal of retained stones.

Post-op Complications	No. of cases	Percentage
Post-op Jaundice	3	6.6%
Wound infection	8	17.7%
Intra-peritoneal collection	2	4.4%
Retained Stone	2	4.4%



Open choledocholithotomy being a major surgery most patients had to stay in the hospital for 10-12 days (60%) followed by 11 patients (24.8%) who stayed for 13-15 days. 8.8% patients were discharged between 7-9 days and only 6.6% of the patients were fit to be discharged on 4-6 days.

DISCUSSION

Curvoisier performed the first successful CBD exploration in 1890 [3,4]. For many years open choledocholithotomy was the primary method of treating CBD stones. In 1968 McCune first introduced ERCP [5]. Over time ERCP has become the first-line of management of CBD stones. However a lack of equipment and skilled personnel restrains the use of endoscopic procedures especially in tier three cities. Also, since ERCP only deals with the CBD stones at a time, an open or laparoscopic cholecystectomy has to be undertaken in the second sitting. More than half of patients managed by ERCP without cholecystectomy will have recurrent symptoms of biliary tract disease [6]. This makes ERCP a two staged approach. In patients with a large stones (>2.5 cm), multiple stones, impacted stones or intrahepatic stones the chances of ERCP failure are high and CBD exploration is the preferred modality.

The diagnostic procedures have also evolved over time. These days apart from trans abdominal ultrasound, endoscopic ultrasound, ERCP, MRCP and intra-operative ultrasound are used to diagnose CBD stones [7,8]. Once diagnosed, an open or laparoscopic choledocholithotomy can tackle both the gall bladder and CBD stone in one sitting. In a recent meta analysis Clayton et al have demonstrated equivalent duct clearance, morbidity and mortality between endoscopic measures and open surgical techniques [9]. Open CBD exploration has hence stood the test of time and is a common choice among surgeons.

The mean age of the study population in our study was comparable to a study done by Ambreen et al [10]. In a study by Sharma M et al T-tube drainage complications after choledochotomy were noted in 25% of patients [11]. Gillatt DA et al demonstrated the complications after choledocholithotomy to be present in 19.4% of the patients out of which 2.7% developed biliary peritonitis and required reoperation while 5.5% patients developed clinical peritonitis [12]. In our study wound infection was the most common complication following surgery (17.7%). Post-operative jaundice was seen in 6.6% patients while intra-peritoneal collection and retained stone(s) were noted in 4.4% cases.

Williams JA et al concluded in a comparative study between primary duct closure versus T-tube drainage following exploration of the CBD that the post-operative hospital stay was significantly prolonged in the T-tube group with a median of 11 days compared to 8 days in the primary closure group [13]. Similar findings were demonstrated by Dasari BV et al [14]. In our study 60% patients had a hospital stay lasting 10-12 days while 24.8% stayed for 13-15 days. Although the T-tube drainage tube may have increased the hospital stay it did provide an easy access to the retained stones as seen in 2 patients.

An open choledocholithotomy with use of intra-operative cholangiogram or choledoscopy is known to have the highest clearance rate. However an intra-operative cholangiogram sometimes increases the overall operative time and often leads to difficulty in interpretation due to leak of dye from CBD or presence of air bubbles within the biliary tree [15]. At our centre, due to the lack of apparatus intra-operative diagnosis was done only on the basis of direct palpation of the stone in the CBD. Complete removal of the stone and patency of the duct was confirmed by infant feeding tube insertion till the duodenum. The rate of retained stones as demonstrated by Suc B et al is known to be lower after an Open CBD exploration than after ERCP (6% versus 20%) [16]. In our study 4.4% of the patients reported retained stone(s) which were later removed using a choledochoscope through the T-tube.

CONCLUSION

The diagnostic and therapeutic modalities for choledocholithiasis have advanced rapidly over the years. The diagnostic tools are not just limited to an ultrasonography but extend to a wide range of MRCP, ERCP and endoscopic ultrasound. ERCP is both a diagnostic and therapeutic modality and is often the treatment of choice. However since it involves a two step approach and rate of failure is comparatively higher it is not always feasible. Laporoscopic CBD exploration is a very promising treatment in such cases although it is a technically advanced procedure with a steep learning curve. Open choledocholithotomy in spite of its invasive nature is a timeless technique to remove multiple or impacted stones or stones higher up in the biliary tree. An intra-operative cholangiogram if available is excellent strategy to validate complete clearance of the biliary tree.

Dilated bile ducts, multiple distal impacted stones or distal duct strictures with stones require surgical drainage procedure such as choledochoduodenostomy or a Rou-en-Y hepaticojejunostomy. Hence there is no one size fits all proposition in the management of choledocholithiasis. Treatment should be custom tailored for every patient according to their medical needs and the local expertise available.

Conflict of interest:
All authors declare that they have no relationship at present or in the previous three years with any organization that might have interest in the submitted work.

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Statements & Declarations:
The authors declare that this article is written in compliance with ethical guidelines and they have no competing interests.

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